

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/681,420	BRITTAIN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tiffany A Fetzner	2859	<i>Am</i>

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 06/04/2004 & the telephonic interview of June 8th & 9th 2004.
2. ☒ The allowed claim(s) is/are 1-37.
3. ☒ The drawings filed on 30 March 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All   b) ☐ Some\*   c) ☐ None   of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

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|--|--|
| <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br/>Paper No./Mail Date _____</li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</li> <li>6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date <u>06/10/2004</u>.</li> <li>7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
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**Examiner's Amendment**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney Timothy Ziolkowski Reg. No. 38,368** on June 8<sup>th</sup> and 9th 2004.
3. The application has been amended as follows:

**A) Replace claim 1 with the following Examiner amended claim 1:**

**Claim 1** --- A method of imaging large volumes without resulting slab-boundary artifacts comprising:

defining a desired FOV larger than an optimal imaging volume of an MR scanner;

selecting a slab thickness in a first direction that is smaller than the desired FOV and within the optimal imaging volume of the MR scanner;

exciting and encoding spins to acquire data that is restricted to the selected slab thickness;

acquiring a set of MR data that includes acquiring full encoding data in the first direction for a subset of another two directions;

step-wise moving one of the optimal imaging volume and an imaging object; and

acquiring another set of the MR data between each step-wise movement until the desired FOV is imaged. ---

**B) Replace claim 28 with the following Examiner amended claim 28:**

**Claim 22** --- A computer program to control a medical image scanner and create images across scanning boundaries without boundary artifacts, the computer program having a set of instructions to control a computer to:

select an FOV spanning an area greater than a predefined optimal imaging area of the medical image scanner;

apply an RF pulse to excite a region in at least a first direction in the selected FOV;

apply magnetic field gradients to encode the region in the first direction;

acquire 3D k-space data in the first direction for a subset of a second and third direction;

reposition the predefined optimal imaging area, with respect to an imaging object, an incremental step;

repeat data acquisition and the imaging area incremental reposition until complete image data are acquired across the entire FOV to reconstruct an image of the FOV. ---

**Examiner's Comment**

***Response to Arguments***

4. The applicant's After-final arguments concerning the **Wang et al.**, reference (i.e. US patent 5,928,148) of June 1<sup>st</sup> 2004 have been considered, and in view of the **examiner's amendment to after final claim 1** which clarifies, with proper antecedent

basis, that the limitations of “acquiring full encoding data in the first direction for a subset of another two directions;” that comprise the MR data set are also aspects of the limitation that sets forth the limitation of “acquiring another set of **the** MR data between each step-wise movement”, applicant’s after final argument’s concerning independent claim 1 of June 1<sup>st</sup> 2004, [See the June 4<sup>th</sup> After-final amendment page 2 paragraphs 2 and 3] are now persuasive.

5. The examiner agrees that the **Wang et al.**, reference requires that image data for a complete FOV be attained before one of “the optimal imaging volume, and an imaging object” is moved in a step-wise fashion, as per figures 6, 3, and 4 viewed in combination with one another. The examiner also notes that in applicant’s invention the step-wise movement of one of “the optimal imaging volume, and an imaging object” occurs before a complete FOV is attained, and that in applicant’s method multiple step-wise movements occur before a desired FOV is imaged. Therefore the rejections concerning the **Wang et al.**, reference from the March 30<sup>th</sup> 2004 final office action are **withdrawn**. The following is an examiner’s Statement of **Reasons for Allowance**

6. **Examiner Amended Claim 1**, is considered to be allowable over the **prior art of record** because the prior art of record does not teach or suggest the combinational method of “imaging large volumes without resulting slab-boundary artifacts comprising: defining a desired FOV larger than an optimal imaging volume of an MR scanner; selecting a slab thickness in a first direction that is smaller than the desired FOV anal within the optimal imaging volume of the MR scanner; **exciting and encoding spins to acquire data that is restricted to the selected slab thickness; acquiring a set of**

**MR data that includes acquiring full encoding data in the first direction for a subset of another two directions; step-wise moving one of the optimal imaging volume and an imaging object; and acquiring another set of the MR data between each step-wise movement until the desired FOV is imaged.**

7. **Claims 2-17** submitted December 9<sup>th</sup> 2003 are considered to be allowable over the prior art of record because they each depend from **allowable Examiner amended claim 1**. Therefore, the same reasons for allowance that apply to **allowable Examiner amended claim 1** apply to **dependent claims 2-12** and need not be reiterated.

8. **Claim 18** submitted December 9<sup>th</sup> 2003 is considered to be allowable over the prior art of record, because the prior art does not teach or suggest the limitations of "An MRI apparatus to acquire multiple sets of MR data with a movable table and reconstruct MR images without Slab-boundary artifacts comprising among its limitation the steps of: **"defining a fixed slab** with respect to the magnet to acquire MR data, **acquire full MR data in a direction of table motion, defined as z-direction, for a selected kx-ky subset in the fixed slab; increment the patient table while maintaining position of the fixed slab; and repeat the acquire and increment acts until an MR data set is acquired across the desired FOV to reconstruct an image of the FOV"** in combination with all of the other features of **claim 18**, it is the combination of all of the features of **claim 18** taken as a whole, that makes **independent claim 18**, allowable over the prior art of record.

9. With respect to **Claims 19-27** submitted December 9<sup>th</sup> 2003 each of these claims are considered to be allowable by the examiner because they depend from allowable independent **claim 18**.

10. **Examiner Amended Claim 28**, is considered to be allowable over the **prior art of record** because the prior art of record does not teach or suggest the combinational computer program to control a medical image scanner and create images across scanning boundaries without boundary artifacts", with "the computer program having a set of instructions to control a computer to: select an FOV spanning an area greater than a predefined optimal imaging area of the medical image scanner; **apply an RF pulse to excite a region in at least a first direction in the selected FOV; apply magnetic field gradients to encode the region in the first direction; acquire 3D k-space data in the first direction for a subset of a second and third direction; reposition the predefined optimal imaging area, with respect to an imaging object, an incremental step; repeat data acquisition and the imaging area incremental reposition until complete image data are acquired across the entire FOV to reconstruct an image of the FOV.**

11. **Claims 29-37** submitted December 9<sup>th</sup> 2003 are considered to be allowable over the prior art of record because they each depend from **allowable Examiner amended claim 28**. Therefore, the same reasons for allowance that apply to **allowable Examiner amended claim 28** apply to **dependent claims 29-37** and need not be reiterated.

12. The Examiner notes that none of the **prior arts of record** teach or suggest applicant's combinational features which comprise an MR method of "imaging large

volumes without resulting slab-boundary artifacts comprising: stepping/repositioning as claimed in the above allowed claims, before a desired field-of-view is established. In all of the prior arts of record at least one FOV is acquired before any stepping/repositioning occurs. Therefore applicant's **examiner amended claims 1, 28**; and the allowed claims of **2-27** and **29-37** submitted December 9<sup>th</sup> 2003 are considered to be novel and nonobvious by the examiner.

13. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

14. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

**A) Wang et al.**, US patent 5,928,148 issued July 27<sup>th</sup> 1999, which teaches a Method for performing MRI Angiography over a large Field of View Using Table Stepping.

**B) Wang et al.**, US patent 6,230,040 B1 issued May 8<sup>th</sup> 2001, which teaches a Method for performing MRI Angiography with Dynamic k-space sampling.

**C) Meaney et al.**, US patent 5,924,987 issued July 20<sup>th</sup> 1999, filed October 6<sup>th</sup> 1997 which teaches an MRI angiography device where a table platform is moved step-wise to image an object greater than the field-of-view of the device.

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**D) Meaney et al.**, US patent 6,311,085 B1 issued October 30th 2001, which teaches a Method and apparatus for MR Angiography using contrast agents which is a continuation of **Meaney et al.**, US patent 5,924,987.

**E) Meaney et al.**, US patent 6,564,085 B1 issued October 30th 2001, which teaches a Method and apparatus for MR Angiography using contrast agents which is a continuation of **Meaney et al.**, US patent 6,311,085 B1 which is a continuation of **Meaney et al.**, US patent 5,924,987.

**F) Yoshitome** Japanese Laid-open Patent Application (kokai) No. H6-304153 disclosed November 1st 1994. [The examiner is using the English version of this reference provided by applicant and submitted with applicant's Information Disclosure Statement].

**G) Yoshitome** Japanese Laid-open Patent Application (kokai) No. H6-311977 disclosed November 8th 1994. [The examiner is using the English version of this reference provided by applicant and submitted with applicant's Information Disclosure Statement].

**H) Pelc et al.**, US patent 6,445,181 B1 issued September 3<sup>rd</sup> 2002, filed November 9<sup>th</sup> 2000 which teaches an MRI method for imaging a Field of View which is larger than a magnetic field, with both step-wise and continuous table motion.

**I) Bis et al.**, US patent 6,493,571 B1 issued December 10<sup>th</sup> 2002 issued June 12<sup>th</sup> 2000, which teaches Rapid MRI angiography of Multiple Anatomical Territories.



**J) Shetty et al., PCT publication WO 98/46983** published 22 October 1998, which teaches Rapid MRI angiography of Multiple Anatomical Territories and corresponds to **Bis et al.**, US patent 6,493,571 B1.

**K) Brittain** US Patent Application Publication US 2002/0143247 A1 published October 3rd 2002, which is the corresponding publication of applicant's instant application, therefore this application is not available as prior art, but is noted only for the purposes of a complete record.

**L) Brittain** US Patent Application Publication US 2002/0140423 A1 published October 3rd 2002, which is a continuation-in-part of applicant's instant application, therefore this application is not available as prior art, but is noted only for the purposes of a complete record.

**M) Brittain** US Patent Application Publication 2003/0011369 A1 published January 16th 2003, which is the continuation of **Brittain** US Patent Application Publication US 2002/0140423 A1 which is a continuation-in-part of applicant's instant application, therefore **Brittain** US Patent Application Publication 2003/0011369 A1, is not available as prior art, but is noted only for the purposes of a complete record.

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### Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

16. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF  
June 10, 2004



Diego Gutierrez  
Supervisory Patent Examiner  
Technology Center 2800